Mass Customization of Print Products

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Abstract

Over the last 12 years, the business model for commercial printers has changed fundamentally. Before wide use of the Internet, most commercial print products were ordered and produced individually in a piece production process. The customer defined the final size, the number of pages, the amount of copies, the paper grade and many other details. Since the emerging of online ordering of printed products, the offering of a web-to-print (W2P) define the product. Customers can only order what the print company offers. Due to the individual content of each order, we can call this production process "mass customization".

This new business model enables printers to leave the inquiry and order process to the customer, to reduce make ready time due to standardization, to collect several orders on one sheet of paper larger than ever (gang run printing, using sheet fed printing presses up to size 7, up to 63 inches), and as a result to reduce the cost of small orders dramatically.

The paper presents the underlying business model in detail and discusses four critical success factors: price leadership compared with traditional organized print companies, publicity, service and continuous improvement. Examples from German Online Printers (e. g. CEWE color (Saxoprint), Flyeralarm, Laserline) cover their history, their value added chain and some highlights of the production processes. Future potential for growth of German Online Printers is mainly seen in the Europeanization of their business model.

The paper concludes that the ongoing learning curve of leading German Online Printers will enable them to keep on reducing costs and enlarging the product range. The market barrier for newcomers is strong. But the idea of mass customization of printed products gives more business opportunities than those Online Printers offer. There are much more market gaps for newcomers who have innovative ideas and are able to play the game of e-commerce, mass customization and internationalization.

The emergence of Online Printers – small business as a gap in the market

Most of us know them trough own experience: e-commerce companies offering short run printing products for nearly all marketing material you need. It's easy to order, fast delivered, the quality is better than expected with prices a traditional local printer gets pale – and he will buy there by himself. These companies specialized in marketing material for the B2C market grew fast over the last 12 years. That's remarkable due to a very competitive and decreasing market segment of commercial printing. What do they do others don't?

There is one common idea of all founders of the first online printing companies: To serve small business companies with low price but high quality professional marketing material. The first movers started their business between 1995 and 1998. At that time most of the midsized printing companies with modern machinery showed no interest in these small clients with their small orders and above all their small knowledge how to prepare the print data. These customers needed a lot of consultancy, individual cost estimation, had a small budget, and were not expected to order larger printing products in the future. For their small business they need only business cards, perhaps some marketing folders, and that's all.

Robert Keane, President and CEO of Vistaprint, the first mover and now estimated the number 1 of all web-to-print companies worldwide with 3.500 employees [1], $ 1.150 billion revenue in 2012 and 13 % to 14 % growth per year since 2002 [2], summarized his idea in his business plan in 1994 during his M.B.A. studies in Fontainebleau, France: "Imagine you are a small business (…). You want to develop a professional and aesthetically pleasing image. The market today does not provide a solution to meet your needs. Everyone knows that the terms high quality, color and professional design simply don't belong in the same sentence with inexpensive, low volume, easy or quick. This incompatibility represents a gap in the market. Simply put, there is a clear market need. [3]". Robert developed a direct marketing catalogue and started his business in Paris, France, 1995 [4].

Other country, related story. Thorsten Fischer is the founder of Flyeralarm, estimated the number 3 of all web-to-print companies worldwide with 1.500 employees [5], Germany. Before founding Flyeralarm he worked as a sole entrepreneur in Würzburg, Germany, and published a city magazine in a remarkable run length of 10.000 copies. The magazine was financed by adverts from local businessmen. His clients, the other small entrepreneurs, asked him to design and print not only their adverts but also their marketing material – more professional designed business cards and folders for example [6]. Due to his contacts to local printers, he tried to help as a broker. He wondered why these short run orders had a longer delivery time than his high volume city magazine. He saw the market gap and had the solution: Gang run printing. He collected the orders, stopped his publishing business and started Flyeralarm in 2002.

Figure 1 illustrates the market gap: Get new business from small customers with the need of professional marketing material.

Fig. 1. Microbusiness Needs as a Market Gap [7]

Small business as a market gap is one part of the success story of web-to-print companies with shops open for B2C clients. In the pre-internet time small business with the necessity of in-depth consulting was done by local small companies. The first movers like Vistaprint and Flyeralarm also started as small entrepreneurs without using the Internet. But as often in economy: you need people as innovators *and* technical innovations. In the case of Online Printers the technical innovation was e-commerce.

E-Commerce and the "Long Tail"

DRUPA 2000 will stay in my memory as "dot.com"-DRUPA. In one hall around 20 start-up companies from different countries offered software for E-Procurement. Their business idea was to get paid through commission for bringing together customers and printers through their Internet portal. Customers had to fill up online forms for their inquiry, and different printers as certified platform partners offered a price – all was done on the portal. The business model failed in the end, but the first tools for form based online configuration of print products were in the market. Around the same time, Vistaprint started its e-commerce shop [4]. Others, like Flyeralarm, followed 2002 [6].

The history of e-commerce is older than the history of web-to-print. Amazon sold its first book in 1995 [8]. E-commerce for articles like books is much less complex than online configuration of print products, which has to be ordered first and printed after ordering. But Amazon and the first movers of online ordered print products had one in common: they all started with small business. Jeff Bezos, founder of Amazon.com, started his success story with rarely sold books. Due to the costly storage of traditional bookshops, they were not interested in these book titles [9], and that was one of Amazons market gaps. Amazon and web-to-print companies have another common history: rapid growth.

Rapid growth with small business in e-commerce is often explained by the Long Tail Phenomena [10]. Vilfredo Pareto, an Italian economist of the 19th century, described it first. An example is visualized in Figure 2. If you took the Top 100 List of best selling books worldwide in history from the German Wikipedia [11], you will get a perfect Pareto Diagram or, as it is termed in the English-speaking world, a Long Tail: the total number of copies of the 20 bestselling books (20 %) is 6.8 billion numbers of copies. The following 80 book titles (80 %) are sold 1.7 billion times. That's only 20 % of the total number of copies of all 100 listed best sellers. To put in a nutshell: 20 % of the bestselling books comprise 80 % of the total number of their copies.

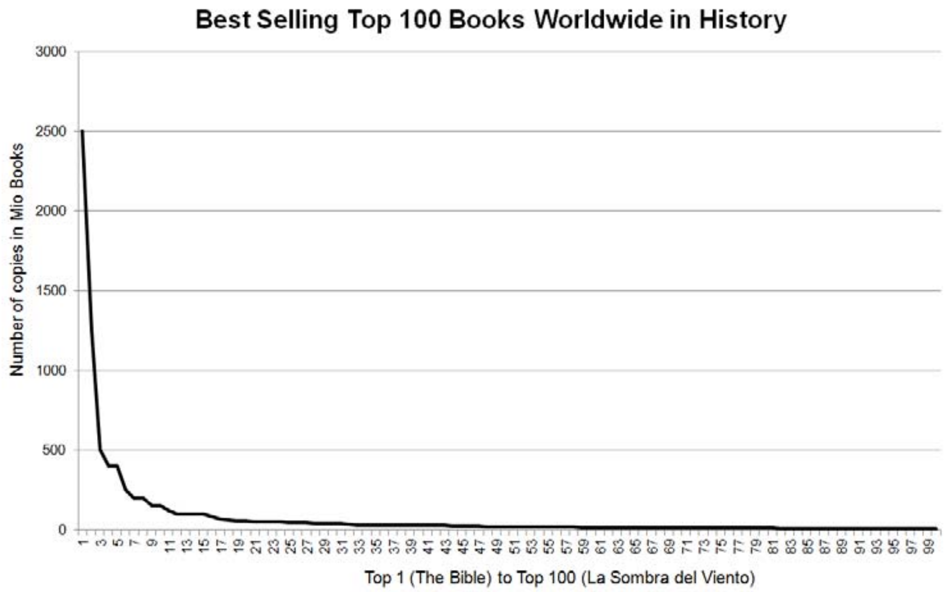

Fig. 2. Long Tail Phenomena Example

The same effect can be seen in business. An example: Most companies do 80 % of their revenues with only 20 % of their customers. To focus on the most important customers, a management categorization technique is used to figure out these 20 % of customers. Key account managers focus on these customers. And the rest, the 80 % of the customers in the long tail, are often managed more or less randomly.

Due to globalized e-commerce shops with their self-service technology, this thinking is history. The Long Tail with all his niches of customers and items became and becomes a starting point for new companies with new ideas – with a potential to grow fast in a niche. And as we can see with Amazon and today's German web-to-print companies: Starting with small business does not mean to constrain yourself to the items or customers of the long tail. The experience curve can hit you from a niche player to a market leader – if you know how to play the game, and if you are among the first in the market.

Critical success factors of Online Printers as market barriers for newcomers

In the last five years I had the opportunity to observe the development of three leading German sheet fed web-to-print, focussing on small business items: Flyeralarm with their plants in Bavaria and Saxony, CEWE Color with their youngest acquisition Saxoprint, founded in Dresden, and Laserline, a first mover in the online print business with today 150 employees in Berlin.

Visiting these companies, doing online research with print and media engineering students and studying the print specialized magazines, it can be concluded that there are four critical success factors for today's web-to-print companies:

- Price leadership compared with traditional printers
- Service
- Publicity
- Continuous improvement

There is no ranking between these four critical success factors. An Online Printer must be able to meet all of these four factors to be a growing part in his market segment. In the following sections they will be discussed in detail.

Price leadership compared with traditional printers

Four times since 2007 my students checked the prices of 30 German web-to-print companies [12]. The online query was always the same, a typical marketing folder for small business: 1.500 copies of a 6 page folder, final size 1/3 DIN A4, printed 4/4 in offset printing quality. Students chose comparable paper from the offered lists (matt coated between 135 g/m² and 150 g/m²) and the offered final sizes (between 9,8 cm and 10,5 cm x 21,0 cm). If the web-to-print shop offered not exactly 1.500 copies, students took the larger quantity (up to 2.500 copies).

Table 1 shows an extract of the survey. Rows 1 to 4 list the prices of the Top 4 Online Printers in Germany, Flyeralarm, unitedprint.com, Saxoprint and Onlineprinters, on four different query dates. Row 5 shows the difference between the lowest and the highest price in percent. In 2007, the difference was 60 %, in 2008 still 58 %. Then the price difference gets smaller to today's 12 %.

This price adjustment is the first awareness. The second finding is the continuous price reduction. Row 6 shows the average price of all dedicated web-to-print shops. It declined from year to year – during the observed five and a half year the reduction is 24 % (row 7). The price reduction cannot be explained by external effects: the external cost driver of the printing industry, the graphical paper, was more or less stable over the period (+ 0,6 % [13]).

Price adjustment and price reduction shows a huge competition in the market of Online Printers. Every company must be able to continuously improve their business to reduce the costs. Otherwise they would go bankrupt over the years.

The survey also shows: many companies could grow in the market, although they had and have different prices. Price is a very important, but not the only reason for customers to choose their print supplier.

Table 1: Price/Cost Check Online Printers and traditional printers from 2007 to 2013

			Data Collection Month/Year			
Row	Company Name	URL	11/2007	9/2008	9/2010	5/2013
1	Flyeralarm	www.flyeralarm.de	83,78 €	83,07 €	83,07 €	73,39 €
2	unitedprint.com	www.print24.de	123,64 €	118,64 €	76,88 €	65,71 €
3	Saxoprint	www.meindruckportal.de	77,07 €	75,14 €	67,62 €	72,00 €
4	Onlineprinters	www.diedruckerei.de	89,00 €	89,90 €	81,80 €	73,72 €
5	Price difference min - max		60 %	58 %	23 %	12 %
6	Average price between companies		93,37 €	91,69 €	77,34 €	71,20 €
7	Changes from 11/2007 to 5/2013					- 24 %
8	Cost Estimation with data from [14] [15]					244,10 €
9	Difference Cost Estimation / Online Printers					- 71 %

Another reflection can be done comparing the average actual price of 71,20 € from Online Printers in 5/2013 (row 6) with the cost estimation of 244,10 € in row 8. 244,10 € is the result of a cost estimation process of the described example folder, using data from the German Printing and Media Industry Organization BVDM [14]. Since more than 50 years, BVDM does intensive data maintenance about cost structures of German traditional small and medium sized print companies. The estimation was done with current computer to plate technology, a four-color press in 50 cm x 70 cm format range, running two shifts and standard post press technology. The paper costs of the 1.500 folders are estimated using average prices of the German market observer company Paperconnect [15]. The cost estimation was done without adding profit.

The conclusion is: If an average traditional printer with modern machinery had to print that folder, he had to handle costs 71 % higher than their online competitors. This enormous price difference is the reason, that meanwhile many traditional printers do reselling with W2P-companies and stopped producing print products not suitable for their cost structure.

It might be argued that the low prices of W2P-companies in this high competitive product area of folders do not cover the real costs of web-to-print. In the case of Flyeralarm there are additional data. Ulrich Stetter, member of the management of the print plants of Flyeralarm, organized in an own company named Druckhaus Mainfranken, offered a deeper inside in their cost structure on an internal speech during an excursion of Beuth University in 2012. Table 2 compares his data with a BVDM estimation, separated for the different production processes. The example of Ulrich Stetter was a folder, 2.500 copies, 6 pages, final size DIN A 4, printed 4/4 on gloss coated paper 135 g/m². Table 2 compares BVDM data with his data, separated into the different production processes. We see a reduced price difference compared with the described folder before, but it is still enormous: In this case a traditional printer has to handle costs 48 % higher than Flyeralarm.

The last row of table 2 shows the result of a query about the described A4-folder in may 2013. The price of Flyeralarm is lower than the costs showed by Ulrich Stetter a year before. It can be supposed that the experience curve of Flyeralarm is an ongoing process, and that they were able to reduce costs during the last year to stay profitable in all products of their product range.

Table 2: Cost of Production Processes Trational Printers / Flyeralarm

	BVDM [14] / Paperconnect [15]	Flyeralarm (internal 2012)
Datacheck, CTP	36,40 €	22,00 €
Printing	171,60 €	33,00 €
Post press	59,50 €	21,50 €
Packaging	11,50 €	7,50 €
Material	121,70 €	102,00 €
Administrative Costs	included in process costs	22,00 €
Total	400,70 €	208,00 €
Difference Cost Estimation / Online Printers		- 48 %
Price query Flyeralarm 5/2013		194,83 €

To learn more about the reasons for the reduced costs in comparison with traditional printers, figure 3 shows the main differences between the cost structures by comparing the different value added chains.

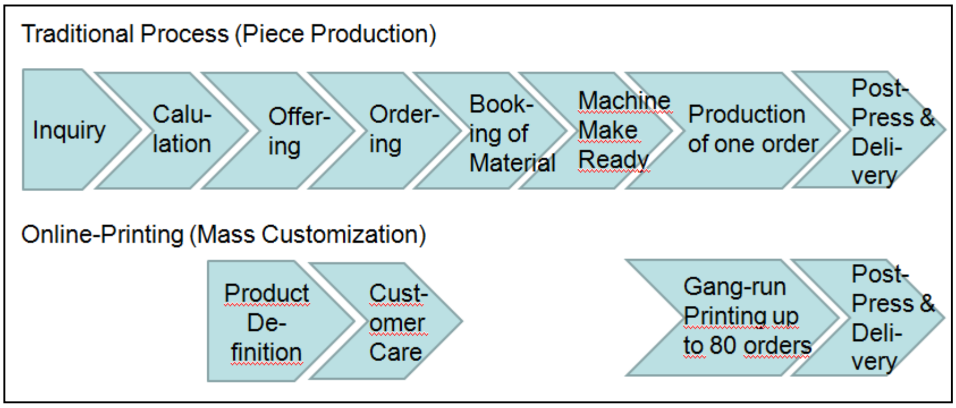

Fig. 3 .Value added chain Piece Production and Mass Customization of Printed Products

Traditional printers are organized for piece production. Every inquiry is seen as unique. It has to be estimated and offered individually. The ordering process often includes a personal customer contact like an e-mail or maybe a phone call. After ordering, material has to be booked and set up for every single order. During the production process, every process like data check, plate processing, printing, cutting, folding, has to be done only for this job. In economics, this way of production is called "job shop production": Every single job goes from one workplace to the other, and on every workplace there is not only the run time, but also make-ready-time. There is a lot of automation in pre-, print- and post press processes in the last years – but still there is make ready time needed for every single job.

Web-to-print companies use the same machinery, but their cost structure is very different. Due to customer self service, customers do the inquiry, the price estimation, the offering and the ordering. Web-to-print companies do not need skilled people for these tasks. Instead, they need skilled people to define the products they offer, to do the pricing and the adjustment for prices for the broadening product range and to develop and improve the shop system.

To build up the e-commerce system is a huge and very expensive project. The e-commerce software of all leading web-to-print companies is programmed by themselves and at the heart of their business. And it is an important market barrier for newcomers. But if you have gone through this innovation phase, the e-commerce shop is a tremendous cost cutting area: Every improvement on the website has to be done only once, and then it can be used by millions of customers. And: As more orders you have in one year, as stronger this cost cutting effect is – an important experience curve the company can use for price reductions.

The second area of tremendous cost cutting is standardization and gang run production. Both depend on each other. Without standardization of the offered paper grade, the amount of copies and the printing size, gang run printing is not possible.

Standardization as a requirement of gang run printing is what Thorsten Fischer did when starting his business with Flyeralarm. He collected the orders of his small business clients, decided by himself about the paper grade, suggested the number of copies or multiples of it, and applied let's say 16 business cards as one print run order by local traditional print companies. The cost cutting effect especially in the processes data check, CTP and printing is obvious. He could offer every business card at a much-reduced price compared with piece production.

The idea of gang run printing itself is not an innovation – it is an obvious idea for everyone working in print business. But in the pre-internet time it was very work intensive to find for example 16 customers willing to buy business cards in a standardized quality at the same time. As a first mover Laserline in Berlin had this problem too. When starting their business for cheap print marketing products trying to use the gang run printing cost cutting effect in 1998, they distributed only by direct marketing a small printed catalogue called “dummy” with standardized print products on defined print days a week [16].

Gang run printing is the most advantage W2P printers have through standardization. The cost cutting gang run printing effect is the reason they buy the biggest sheet fed printing machine in the market: KBA Rapida 162a, Heidelberg Speedmaster XL 162 or Roland 900 XXL. By now they are able to collect more than 80 orders on one sheet of paper. The gang run cost cutting effect is also the reason for the difference between – 71 % in the smaller folder with shorter print run length in table 1 and – 48 % in the larger folder with longer print run length in table 2. The smaller the print size and the shorter the print run length, the higher is the gang run printing cost cutting effect.

Besides gang run printing, there are more advantages through standardization for W2P printers. Only through standardization and as a result the reduction of the variety of printing products is it possible to build up an easy-to-use e-commerce website. Only through standardization it is possible to reduce the make-ready time of folding machines producing only one sort of folder. Only through standardization of paper grade is it possible to buy paper not from the paper suppliers but directly from the paper mill.

The price leadership, compared with traditional printers, is reached through the triangle of e-commerce, standardization and gang run printing. That was the market entry. Additionally, W2P printers must reduce their internal costs continuously to stay in the market. But W2P companies customers do not always take the cheapest offer. Due to good customer’s experience, repurchasing and recommendations are possible.

Publicity

The German online portal www.druckdeal.de lists around 1.200 online printers or print sellers for the product range of flyers and folders. [17]. Without a clear publicity strategy, there is no chance to grow sustainably in this multitudinous market. Publicity is the second critical success factor for today’s Online Printers.

W2P Printers do online marketing. Robert Keane of Vistaprint described their efforts in an Interview: “... firstly we truly have become a world class practitioner of internet-based direct marketing. We have built a very strong direct marketing talent pool, which are analytical and technology-driven. Secondly, word of mouth is an important driver in our business. To put our advertising expenditure into perspective, we currently have about 300 million USD in annualized revenues, of which we spend about 33% on marketing, or about 80 million USD. Given our revenue growth, this is increasing at a rate of between 60 and 70% a year” [4].

In addition to intensive online marketing activities, Online Printers have quite different strategies to ensure long-lasting market awareness. Vistaprint strengthens its focus to B2C clients, concerning their product range, web to print design tools and marketing campaigns in B2C platforms like gmx. Flyeralarm does company branding e. g. by sports sponsoring and board advertising in soccer stadiums. Additionally they started to build up brick stores in major German cities for consultancy and pick up service. Laserline focuses on professional repurchasers of advertising agencies, print companies and graphic design studios. They conduct professional and knowledge intensive newsletter marketing, offer elaborate print job samples in their “Black Box” (with Laser-Line branding on the samples) and “White Box” (without branding on the samples for resellers use), including other helpful tools for professional graphic production. Plus, their seminars are well-known in the graphical scene of Berlin and are conducted in their impressive headquarter.

Service

The cost advantage of W2P printers through e-commerce comes along with volatile customers. As it is say: the competitor is just one click away. To build up customer loyalty, a W2P company must not only offer competitive prices, but also good service.

Service starts with the usability and service orientation of the e-commerce website. All leading German W2P printers have customer portals for order tracking, reclamation processes and easier repurchasing through archives. For professional print buyers this service sometimes is more important than a slightly cheaper price of the competitor. Online Printers focussing on B2C customers offers easy to use design services. And all leading German Online Printers conduct company owned a call centre with skilled staff.

Continuous improvement

Starting between 1998 and 2002, the leading W2P printers in Germany went to an experience curve difficult to meet by newcomers. All processes in the value added chain are under continuous improvement. The most expensive production process, the printing process, is under particular surveillance:

- To reduce the make-ready time of the print process, first W2P printers test special imposition software for gang run printing. The target is to impose the different orders in such a way that the amount of ink of every ink zone is related to the ink zone of the previous gang run. If there are 50 or more plate changes a day, five sheets of reduced waste is a critical success factor.
- Buying state-of-the-art machinery can reduce make-ready time up to 30 %. An example: Unitedcom.org with its plant in Radebeul, Germany, was the worldwide first buyer of Heidelberg Speedmaster XL 162-8P in 2011 [18]. The same machinery now is used by print factories of Flyeralarm and Saxoprint. Klaus Sauer, CEO of Saxoprint, said in an interview 2012, after buying the second XL 162 machine for gang run printing orders: “The leap in productivity possible with this machine is simply revolutionary for offset printing. Makeready times are just one third of what was previously typical.” [19]. Also most of Online Printing companies use inline density control. “When printing flyers this can cut waste by as much as ten per cent”, said Michael Deml from Flyeralarm [20].

Some other improvements over the year form post press and logistics:

- Due to modern print machinery with double gripper delivery the jogging process can be eliminated – although some Online Printers reduce the intermediate cut to 2 mm.
- Flyeralarm saw increasing demand for low volume printed envelopes. Traditional printers buy unprinted envelopes and for that reason had to handle slow printing processes. Together with Winkler + Dünnebier, a specialist for envelope manufacturing solutions, Flyeralarm developed a sheet fed envelope production machine and thus changed the process: printing the design in gang run printing with all the gang run and automation cost advantages, and doing the envelope production as a post press process.

Mass customization of print products – an ongoing growing market

Looking back at the described four critical success factors of German Online Printers and their experience curve over the last years, there are now strong market barriers for newcomers. The investment in e-commerce-software, publicity and machinery is very high, and for latecomers it is much more difficult to enter into this dynamic and competitive market. In the last year there was only one new bigger online print company with own production lines in the German market, CEWE Color with its new brand CEWE Print [21]. CEWE Color, a stock corporation and Europeans market leader for photo books with 3.300 employees [22], adjusted its business model from the B2C market of photobooks to commercial digital and offset printed print products for professional B2B customers last year by entering the sheet fed online printing market. But CEWE Color was not really a newcomer in online printing. They integrated the former top 3 of German W2P printers, Saxoprint, into their company.

German statistics and data from specialised literature allow estimation about the market potential of B2B online printing. Figure 4 shows the official published market volume of commercial printing in Germany (grey columns). This market segment decreases from 6.1 billion € in 2007 to 5.2 billion € nowadays. To get an idea about the potential of mass customized online print product, the turnovers of the five German W2P printers were summarized. Additionally, the turnover of Vistaprint and the next 15 web-to-print companies in the German market were estimated. Using this method, online printed products started with 200 millions € in 2007 and has by now a turnover of 700 millions €. The conclusion is: Online printing of commercial products is a growing market in a declining segment. Online Printers grow through cannibalization of market shares of traditional printers.

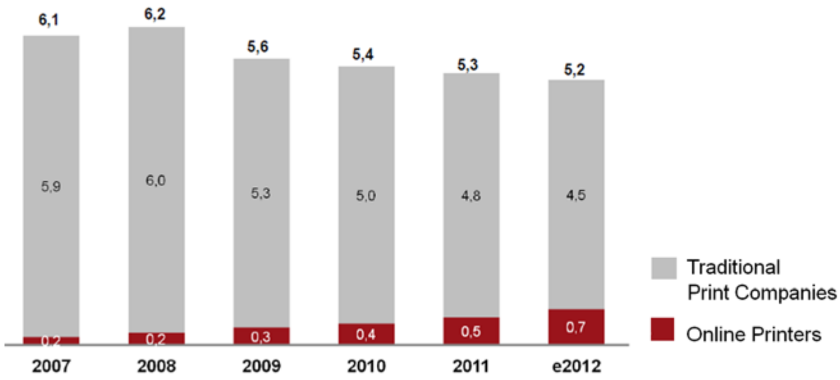

Fig. 4. Market Development of Commercial Online Print [22]

The second potential for growth is Europeanization and Globalization. All German Online Printers built up regionally adapted e-commerce sites. And Vistaprint is the benchmark. Along with one of Robert Keane strategic key point, “a commitment to being totally international in the way we think and act” [4], Vistaprint has 31 localised Websites and ships to 130 countries. Unitedprint.com follows with 24 localised websites. Web-to-print companies like CEWE Color and Flyeralarm are still in an ongoing process of internationalization with eleven, eight and six regional websites respectively.

What does this say for the majority of traditional print companies, the small and medium sized companies all over the world? For some of their business, they cannot compete against the price, the delivery time and the print quality of W2P printers. They have lost some customers with demands on short run marketing material. For others, they co-operate with W2P companies. Michael Deml from Flyeralarm described it in an interview: “You must realise that over 80 per cent of our customers are businesses, which have their print work designed by professional agencies or freelancers (...). A lot of smaller printshops also advise their customers and prepare their data, but have us print the products” [20]. The Online Printers started with B2C: small business items for small customers. Now they are in a big market segment of the B2B market.

And what does this say about future innovators? The market for mass customized printed products is much more differentiated than standardized marketing material on paper. The described long tail in the digital economy is and will be in future a starting point for new business in mass customized printed products.

An ongoing driver for successful business ideas in mass customized printed products is technology, in particular digital print technology. Figure 5 shows the result of a benchmark study of 500 mass customized products – form personalized fashion & textiles like T-Shirts to mass customized computers, the business model of DELL computers [23]. The TOP 1 is personalized media – and much more of them need print technology to be produced in an effective and cheap way: From mass customized wall paper to mass customized ceramics, from mass customized printed flip flops to mass customized golf balls. And a lot of other mass customized products need packages, for example mass customized muesli mixes.

Category	Description	Exemplary Products	Frequency
1. Personalized Media	Flat prints on paper or "near paper" objects, such as canvas	Book, calendar, canvas, wallpaper,	96 19,2%
2. Personalized Fashion & Textiles	Mostly printed T-Shirts plus other fabrics	T-Shirt, blanket, underwear	78 15,6%
3. Food & Nutrition	All you can eat or drink	Chocolate, cereals, tea	57 11,4%
4. Personalized Look	Prints on non-paper materials	Bag, mug, skin	49 9,8%
5. Made to Measure Apparel	Women's and men's formal apparel	Suit, shirt, jacket, skirt	48 9,6%
6. Jewelry & Bag & Accessories	All the things which improve your personal appearance	Ring, sun (glasses), watch, bag, belt	41 8,2%
7. Misc	All the things which do not fit into the other categories	Toys, instruments, stuff	38 7,6%
8. Household & Furniture	Big and small things you use at home	Garden shed, bed, table, pet equipment,	31 6,2%
9. Sports	Sports equipment	Bike, skateboard, golf ball	30 6,0%
10. Footwear	All that covers your feet	Shoes, boots, Flip Flops	23 4,6%
11. Computer & Electronics	Different electronic products	PC, notebook, accumulator	9 1,8%

Fig. 5: Categories and frequency of international benchmark study on mass customizetion and personalization in consumer e-commerce [23]

Like Robert Keane and Thorsten Fischer with their web-to-print companies, the starting point of new business ideas in printing industry continues to be the discovery of a market gap. From this point on, e-commerce with its chances in niches, combined with digital print technology and the ability of continuous improvement of the production process, there is an open future for the print business.

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